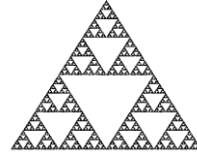


The Sierpinski Triangle



We are going to create a famous fractal called the Sierpinski Triangle.

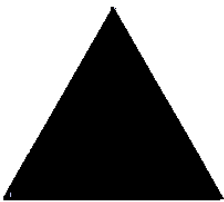
Using a sheet of paper, draw an equilateral triangle with side length of 2 units. Now connect the midpoints of each of the three sides of your triangle. Does this look familiar?



Shade in the three triangles that are pointing up. This is Stage 1 of the Sierpinski Triangle! You may notice that stacking three equilateral triangles can create the figure above leaving a hole in the middle. If we call one triangle Stage 0 of the Sierpinski Triangle, then the next stage can be made from three copies of the previous stage.

1. Draw Stage 2 below.

Stage 0



Stage 1



Stage 2



2. What fraction of the triangle in Stage 1 is shaded in?
3. What fraction of the triangle in Stage 2 is shaded in?
4. Use this information to predict the fraction of the triangle in Stage 3 that will be shaded in. Confirm your answer by drawing Stage 3.

5. Can you predict the fraction of the triangle in Stage 10 that will be shaded in? Describe the pattern in words or symbols.
6. Let's explore some patterns in the Sierpinski Triangle. Remember that the white areas in the stages are holes, so the perimeter includes both the outside of the triangle as well as the lengths around the holes.

Stage Number	0	1	2	3	4	5
Number of Shaded Triangles	1	3				
Fraction of Triangle that is Shaded	1	$\frac{3}{4}$				
Fraction of Triangle that is not Shaded	0	$\frac{1}{4}$				

7. How many shaded triangles are in stage 4? Stage 5? Describe the pattern in words, then write a formula to find the number of shaded triangles in the n^{th} figure.
8. How does the fraction that is shaded change as the stage number gets larger and larger?
9. Now look at the fraction of triangle that is shaded in each stage. On a sheet of graph paper:
- Write a short paragraph that verbally describes the pattern.
 - Draw a graph that relates the stage number to the fraction of shaded triangle.
 - Write a formula (equation) that shows the fraction of triangle that will be shaded in the n^{th} figure.